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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/523,392	02/03/2005	Akira Akasaka	264741US2PCT	3897

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EXAMINER	
ELVE, MARIA ALEXANDRA	

ART UNIT	PAPER NUMBER
1793	

NOTIFICATION DATE	DELIVERY MODE
11/29/2007	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary

Application No.

10/523,392

Applicant(s)

AKASAKA ET AL.

Examiner

M. Alexandra Elve

Art Unit

1793

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 07 September 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,2,5-7,9 and 10 is/are pending in the application.
- 4a) Of the above claim(s) 10 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,2,5-7 and 9 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 03 February 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date 2/3/05, 6/22/05, 1/26/07.
- ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- ☐ Notice of Informal Patent Application
- ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

Applicant's election without traverse of group I (claims 1-9) (claims 3-4 & 8 have been canceled by applicant) in the reply filed on 9/7/07 is acknowledged.

Claim 10 is withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected group II, there being no allowable generic or linking claim. Election was made **without** traverse in the reply filed on 9/7/07.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-2, 5-7 & 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Arai et al. (USPN 6,531,677) in view of Neev (USPN 6,156,030).

Arai et al. discloses:

...apparatus ... spatial energy distributions are made top-hat-shaped with beam homogenizer units in the paths, and the diameters and the energy densities are adjusted independently. (abstract)

FIG. 2a is an illustration showing energy distributions of UV laser beams and thereby an extending process of a hole in an RCC substrate.

FIG. 3a is an illustration showing energy distributions of UV laser beams and thereby an extending process of a hole in a resin-direct substrate.

...optical system of a laser machining system... acousto-optic deflector 6 is set along the optical path of the laser beam 2...top-hat-shaped spatial energy distribution...the laser beam 2 is reflected by a corner mirror 5...reflected by a corner mirror 5... and goes into a machining head Z, which contains two galvanometer mirrors and a f- θ lens as shown in FIG. 17. Finally, the laser beam 2 is positioned with the galvanometer mirrors, condensed and perpendicularly incident on a surface of a substrate to be machined by the f- θ lens. (col. 7, lines 4-38)

In FIG. 2a...pulse energy E_{Pi} was 0.06-0.10 mJ, ...Additionally, a multi-pulsed processing in a circular positioning of the beam spot ("circular processing" or "trepanning" as shown by an arrow in FIG. 2a) ... because the machining beam spot was smaller than the window. In this case, the required total number N_i of pulsed shots was 100. (col. 8, lines 59-65 & col. 8, lines 1-3)

FIG. 3a shows energy distributions...

...Since the spatial energy distribution of the first laser beam 2_i was top-hat-shaped, the residual thickness was substantially uniform. (col. 9, line 59 & col. 10, lines 17-20)

...the machining spot diameter d_{sk} of 120 μm , which is larger than the window diameter was set at 50 μm , which was identical to the hole diameter with the first laser beam, in order to prevent damage of the other part. (col. 10, lines 26-28)

Arai et al. teaches a laser, a reflecting mirror, and uniform energy distributions (may be changed/uniform figure 2a or uniform figure 3a). Although a reflecting mirror was taught an optical switch is not taught. A laser is taught but not the oscillator.

Neev discloses:

Thus, the beam is redirected so that either a single or multiple beams are formed and such that their energy distribution at any given location on the target material forms a sequence of electromagnetic pulses. Each electromagnetic pulse preferably has a duration between approximately 1 femtosecond and approximately 10 milliseconds. (col. 11, lines 44-50)

...the switching device redirects sequential portions of the beam to separate locations so that the net affect at each location is that of a sequence of pulses of specific duration and the step of redistributing the beam comprises directing the beam to a device selected from a device such as a rapidly rotating mirror or other optical means for directing electromagnetic radiation, a Kerr cell, a Pockels cell, and acousto-optic modulator, an electro-optic modulator, or any other electro-optical, electrical, magnetic, or electromagnetic means for redirecting light. (col. 12, lines 16-26)

A controller redirects the redistributed beams so that the energy distribution at any given location on the target material forms a sequence of electromagnetic pulses... (col. 13, lines 22-27)

The first controller preferably comprises a switching device such as a rapidly rotating mirror, a Kerr cell, a Pockels cell, and acousto-optic modulator, an electro-optic modulator, or other electro-optical, electrical, magnetic, or electromagnetic means for redirecting light. (col. 13, lines 58-62)

FIG. 11, is a graphical representation of a sequence of incident pulse train, the corresponding time-dependent heat diffusion, and the ablative removal of sections of the heated volume

laser system... shorter pulse regime laser system... mode-locked oscillator 384 which operates to provide pulses having the same or shorter durations than the desired final pulse duration. The mode-locked oscillator 384 is pumped by a solid-state laser, a diode array, or an Argon-ion pump lasers 382. Commercially available oscillators, providing 100 femtosecond pulses, as well as laboratory built oscillators, providing 15 femtosecond pulses... (col. 47, lines 20-31)

The output laser beam 440, is then directed by a beam-switching device 427 as shown in FIG. 8c. Such a beam switching device may, for example, comprise the well known Pockels Cell, the well-known Kerr Cell, a rapidly rotating mirror. It may also consist of other mechanical, optical, electrical, magnetic, electromagnetic or any other means of rapidly switching out a portion of the electromagnetic beam so that a pre-determined time duration can be precisely selected. (col. 50, lines 16-25)

212 shows three exemplary curves illustrating a one-dimensional thermal energy distribution as a function of distance from the target material surface. The curves 214, 215, 216, show that with time, the deposited thermal energy associated with first pulse diffuses into deeper regions (larger X values) of the targeted material. Here 214 represents an exemplary thermal energy distribution following the first pulse energy deposition at $t=0+\tau$ (where τ is the pulse duration). If τ is short enough (for example, less than 1 μ s in an exemplary water-like material) so that thermal diffusion is negligible (e.g., less than 1 μ m) 214 will essentially correspond to the optical energy distribution where optical energy has been converted to thermal energy. The curve 215 is the thermal energy distribution at some later time, and 216 is the thermal energy distribution ... (col. 60, lines 64-67 & col. 61, lines 1-12)

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the optical switching device and the laser oscillator as taught by Neev in the Arai et al. apparatus because the optical switching ensures an exact energy distribution amount. The laser oscillator is a common component of a laser system.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. See US PTO-892.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to M. Alexandra Elve whose telephone number is 571-272-1173. The examiner can normally be reached on 7:30-4:00 Monday to Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jonathan Johnson can be reached on 571-272-1177. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

November 24, 2007.

/M. Alexandra Elve/
M. Alexandra Elve
Primary Examiner 1793